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Air Force Institute for Advanced Distributed Learning e-CDC Transition Project

Executive Summary

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18 January 2005

Summary

A transition from paper-based CDCs to online e-CDCs is inevitable. This project explored the issues and operational implications required for AFIADL to accomplish such a transition under different funding scenarios. As a result, three e-CDC transition Courses of Action (COA) with different levels of support were developed.

Contents

1. Purpose	1
2. SOW Requirements	1
2.1. Scope	2
2.2. Rationale	2
2.3. Conditions	2
3. Method of Investigation.....	2
4. Findings	2
4.1. Report 1: Issues & Milestones	3
4.1.1. SOW Task 3.1.....	3
4.1.2. Summary of Findings	3
4.2. Report 2: Operational Implications	4
4.2.1. SOW Task 3.2.....	4
4.2.2. Summary of Findings	4
4.3. Report 3: Concept of Operations.....	5
4.3.1. SOW Task 3.3.....	5
4.3.2. COA A.....	5
4.3.3. COA B.....	6
4.3.4. COA C.....	6
5. Appendix: Three Courses of Action	7
5.1. COA A: Maximum effort.....	7
5.1.1. Summary.....	7
5.1.2. Tasks	8
5.2. COA B: A bolus of funding.....	10
5.2.1. Summary.....	10
5.2.2. Tasks	11
5.3. COA C: Slow, internally funded.....	12

Air Force Institute for Advanced Distributed Learning
e-CDC Transition Project : Executive Summary

1.1.3. Summary..... 12

1.1.4. Tasks 13

1. Purpose

This document is intended to provide the reader with a snapshot overview of the Air Force Institute for Advanced Distributed Learning (AFIADL) e-CDC¹ project. Requirements from the statement of work (SOW) will be followed by summaries of method, findings and key recommendations.

Delivery of paper materials has become more problematic with the expeditionary Air Force as the mobile warfighter is deployed—and redeployed—over the globe. Providing the timeliest information in instruction is increasingly important with rapid changes in technology; optimally, instruction will merge with electronic performance support systems (EPSSs) to develop and maintain up-to-date capabilities in the mobile warfighter. It is inevitable that much of the Air Force's instruction will transition from a paper-based form to online instruction to meet these needs. An additional need is the reuse of materials to increase the return on investment (ROI) of the development of quality instructional modules. The Department of Defense (DoD) has adopted the Advanced Distributed Learning initiative's (ADL's) Sharable Content Object Reuse Model (SCORM) specifications for online instruction. ADL is finishing its Content Object Repository Discovery and Resolution/Repository Architecture (CORDRA) system. A transition to online instruction must be compatible with SCORM and CORDRA specifications. AFIADL currently develops and distributes a large number of CDCs that are also used as Weighted Airmen Promotion System (WAPS) material. The purpose of this project was to develop plans for transition from a paper format of CDCs to an online delivery of e-CDCs while still supporting the need for WAPS materials.

1. Conduct an independent, objective analysis of the major programmatic issues involved in transition to e-CDCs and to compare these findings with the clients current priorities and activities
2. Analyze the operational implications of the electronic transition and ensuing life-cycle management.
3. Assist AFIADL in the development of concept of operations (CONOPS) for an e-CDC transition.

2. SOW Requirements

The SOW was awarded to CAL, Inc. on 14 Sep 2004. Due to Hurricane Ivan the kick-off meeting was delayed until 4/5 Oct 2004.²

¹ electronic career development course

² The nominal period of performance is one hundred calendar days, however the effort will continue until AFIADL is completely satisfied with the outcomes.

2.1. Scope

From the SOW, “The purpose of this task is threefold: 1) Validate and/or enhance client’s understanding of the key programmatic issues involved in the conversion of Career Development Courses (CDCs) to electronic format (e-CDCs); 2) analyze the operational implications of the transition and ensuing life-cycle management; and 3) develop an e-CDC contingency operational plan for the AFIADL.”

2.2. Rationale

From the SOW, “There are many stakeholders in the CDC system, each with a unique perspective of the potential risks and rewards of electronic transition. Currently, there is no consensus nor is a formal decision pending. However, the concept has received sufficient attention from stakeholders that it is both prudent and timely to develop a contingency plan.”

2.3. Conditions

From the SOW, “1) To sharpen the focus on practicality, the investigators will operate under the artificial assumption that a decision to migrate to e-CDCs is inevitable; 2) To help preserve objectivity, the contractor awarded this task must accept being excluded from competition for converting exiting CDCs to electronic format.”

3. Method of Investigation

CAL assigned two principal investigators, Dr. Tom Wason and Bob Norris.³ AFIADL assigned Dr. Adelaide Cherry, Lt Col Kibbe, and Mike McCrocklin as principals. Three site visits were scheduled, each comprised of two full days of meetings, seminars, and/or workshops. Sixteen AFIADL personnel participated in the project. In between site visits, the investigators and AFIADL participants interacted via the AFIADL e-CDC Project website.⁴ The investigators generated 3 technical reports, 1) Issues & Milestones, 2) Operational Implications, and 3) Concept of Operations. Each report was reviewed and critiqued by AFIADL participants and subsequently revised by the investigators. A report package will be published as the final deliverable.

4. Findings

The overall finding is that AFIADL is prepared to move forward into an e-CDC development program, but should make changes to the work process before or simultaneous with the transition to an e-CDC program. These changes will have implications throughout AFIADL and with its external linkages. It is recommended that AFIADL undertake some of the critical changes within its CDC development process at the earliest time to maintain the momentum developed by this project.

³ The investigators’ qualifications are detailed in the CAL, Inc. bid for this contract.

⁴ Use of the project site - found at www.CAL-Advisor.com – allowed the investigators to demonstrate many aspects of network-based learning that are germane to the e-CDC transition.

The SOW specified three tasks that would serve to fulfill the project goals. In terms of the USAF's OODA concept (Observation, Orientation, Decision, Action), the first report focused on Observation and Orientation. The second report focused on operational planning (Decision), and the third report provided a concept of operations, CONOPS plan (Action) for three different funding scenarios. The investigators' findings will be summarized below by report.

4.1. Report 1: Issues & Milestones

4.1.1. SOW Task 3.1

“Conduct an independent, objective analysis of the major programmatic issues involved in transitioning to e-CDCs and compare these findings with the client's current priorities and activities.

4.1.2. Summary of Findings

AFIADL's understanding of e-CDC programmatic issues is accurate in that there is awareness of what is known and what is not yet known. Furthermore, no evidence has surfaced to indicate that potentially difficult challenges are being trivialized or ignored. AFIADL is clearly keeping abreast of current developments in ADL and this contributes to the currency of their knowledge of e-CDC related topics. With respect to completeness, there are technical issues that are not yet well understood by AFIADL, e.g. XML, Handles, CORDRA, but these are emerging technologies whose need is just surfacing. AFIADL has a good understanding of the process for developing CDCs, but does not yet have a complete understanding of the how differences between CDCs and e-CDCs will require fundamental changes in the course creation and maintenance process (life cycle management). The organizational changes needed to support the parallel efforts of participants are not yet well understood. And there appears to be a need for refining AFIADL's strategic policy, e.g. to achieve an effective e-CDC lifecycle management, AFIADL conveys to its clients a new value-added proposition.

Changes in the CDC development process will support the subsequent transition to e-CDCs. The AFIADL process, although able to consistently develop and publish CDCs, is not what would be considered in a "state of control." Considerable back channel communications consisting of telephone calls and emails between AFIADL personnel, AFCFMs and the SMEs are required to maintain scheduling and provide input into the instructional design process. Reuse of modules, when it occurs, is inconsistent. A more robust workflow process with a quality assurance program is missing. A knowledge management system would support the quality assurance (QA) process, protect against the loss of key personnel and support increases in staffing. The Integrated Learning Center (ILC) has an unused knowledge management component that may support this need. The instructional systems specialists (ISSs) are underutilized, and should participate earlier in the course development process, including reuse planning. ISSs might better fill some of the project management tasks filled by the curriculum manager. The ISS should interact with the AFCFM at an early stage in the course development, before the SME develops the course. Ideally the ISS will participate in the Utilization and Training Workshop (U&TW) either in person or virtually.

With no strong instructional effectiveness evaluation program it will be difficult to develop best practices guidelines for e-CDCs. Version management is effective, supporting CDCs and WAPS materials. It will probably not be suitable for fine-grained reusable module version management, which will also require policy decisions. Course material conversions in form and format (e.g., e-CDCs and WAPS) may be difficult in the current MS Word model; the use of XML should be considered. By addressing these issues, AFIADL can offer a significant value added proposition to requesting agencies and Air Force.

MS Word is currently used as a source code for CDC development. CDCs are created from MS Word documents as PDFs that are used to print out the final CDCs for distribution. The use of MS Word may be expanded through the use of master documents within Word to provide reusable modules. This will presage the use of XML, providing a smooth transition into XML as the source code. It is expected that MS Word will support XML in the future. A transitional delivery of CDCs may prove effective. PDF CDCs may be subdivided into sections and enhanced with links and media (e.g., animations). These digital CDCs (d-CDCs) may then be delivered using an LMS packaged in a SCORM compliant manner or directly in a modular fashion. d-CDCs may be supplemented and updated more easily than paper CDCs. Such updates may be targeted for delivery to specific levels of command.

4.2. Report 2: Operational Implications

4.2.1. SOW Task 3.2

“Analyze the operational implications of the electronic transition and ensuing life-cycle management.” Specific emphasis was required on the role of SMEs, process re-engineering, course maintenance, impact on WAPS, tasks for potential outsourcing, and selection criteria for courses to transition.

4.2.2. Summary of Findings

An overarching analysis was conducted from the perspective of five operational domains the organization will use to execute its mission:

4.2.2.1 Quality Assurance

Existing CDC process-oriented quality control elements should be used as a foundation for a robust QA program for e-CDC development. Given the complexity of e-CDCs, AFIADL will need to extend traditional boundaries to develop QA for both the course development process and instructional effectiveness.

4.2.2.2 Project Management

Transitioning to e-CDCs is an endeavor that will surface problems of an unfamiliar nature. In this context, project management might just as well be termed “problem” management. AFIADL is well positioned by reputation, resources, and inclination to assume the posture of scientific analyst on

behalf of the USAF. In this role, AFIADL can define success, manage stakeholder expectations, control information, and impose scientific problem-solving rigor.

4.2.2.3 Workflow Management

Teams will develop courses; consequently the workflow management system must be able to interact effectively with the team members. Workflow management should reflect the following core principles, 1) Instructional design must occur early in the development process; 2) Reuse planning must be an integral part of the process; 3) Develop a table of contents (TOC) system that links aspects of the course together; 4) Robust content management is required; and 5) A collaborative online work environment that gives managers an over-the-shoulder perspective should be used.

4.2.2.4 Course Development by Team

Course development should be a team process, with a team comprised of members whose individual responsibilities are defined by one or more roles. Development should take place in an online environment since the courses created will be engaged online by students. ISS personnel will become involved earlier in the development process to leverage their skills. The team will require skills that are not yet on hand; some tasks can be readily outsourced.

4.2.2.5 Technology

e-CDCs are created, published, distributed, used, and managed in the digital realm. A mature e-CDC system is based on technologies that support five major functional requirements of the e-CDC lifecycle: Authoring, Approval, Publication, Archiving/Versioning, and Revision. The technological approach recommended for AFIADL is to create a modular systems architecture based on a web services model (also known as a "services oriented model (SOA)"). This is consistent with the ADL's CORDRA system, a significant factor in external funding and participation.

4.3. Report 3: Concept of Operations

The three courses of action (COAs) were developed reflecting different funding scenarios.

4.3.1. SOW Task 3.3

Assist AFIADL in the development of concept of operations (CONOPS) for an e-CDC transition for three funding scenarios.

The three courses of action (COAs) are summarized below. Additional information on each is provided in the appendix.

4.3.2. COA A

Premise: Programmatic multiyear funding (in excess of \$5M)

Air Force Institute for Advanced Distributed Learning
e-CDC Transition Project : Executive Summary

This is a maximum effort based on sustained, programmatic funding. This is the fast track scenario. The e-CDC infrastructure will be leading edge. Contract support will be extensive. The focus is on rapid development of capacity and capabilities. The COA supports a leadership position in SCORM course management. Transitions will be accomplished in the CDC system in parallel with development of the infrastructure for e-CDC development. As appropriate, modules of the infrastructure will be used in the CDC program for testing prior to the transition to an e-CDC development mode. With continuing support, the ISSs will have a larger role orienting the process more directly toward instructional effectiveness.

4.3.3. COA B

Premise: Short-term windfall (\$1M - \$5M)

A bolus of funding allows a jump to e-CDC capability, but without an increase in annual programmatic funding. This is the windfall scenario. Investment will be aimed at maximizing ROI. The focus is on acquiring robust foundational technologies and capabilities to demonstrate e-CDC value and elicit multi-year funding. Changes to the existing CDC process will be instituted. The basic technological system will be developed and thoroughly tested before integrating it into the development process. The program will result in a basic e-CDC development system.

4.3.4. COA C

Premise: Modest investment (less than \$1M)

Slow, internally funded development proceeds with careful steps, each of which moves the course development securely forward. The focus is on discovery and preparation in anticipation of future funding. Many changes, such as QA programs, will be made in the CDC development system in preparation for the transition to the e-CDC system. Some modules of the infrastructure will be developed such as an online development environment and a basic metadata system. This COA will make it possible, but not optimally so, to develop e-CDCs at some time in the future.

5. Appendix: Three Courses of Action

5.1. COA A: Maximum effort

Conduct an independent, objective analysis of the major programmatic issues involved in transition to e-CDCs and to compare these findings with the client's current priorities and activities

5.1.1. Summary

This COA features a rapid application model, which is analogous to "shock and awe." It will be the most rapid path to providing online instruction to the warfighter. Technological infrastructure modules are developed quickly and tested in the CDC process. The modules are then refined based on the results of the CDC testing. The CDC process is simultaneously serving as a platform to institute organizational changes including:

- Transition to a team-based work process,
- Implement a workflow QA program
- Implement an instructional effectiveness QA program
- Implement an online collaborative work environment (OCWE)
- Involve the ISSs in the instructional design
- Develop reuse planning guidelines

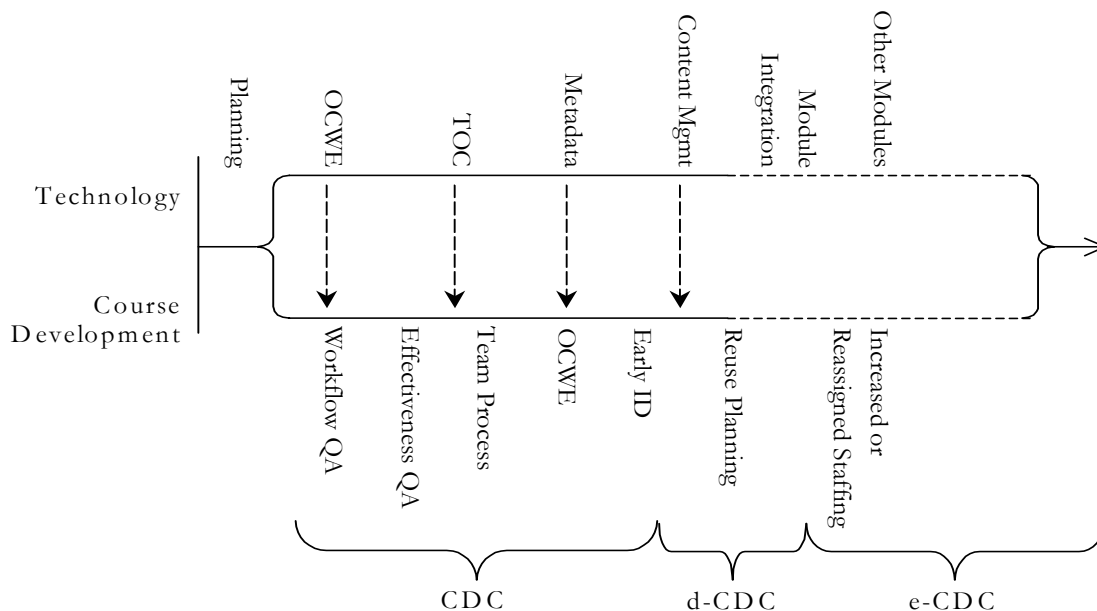


Figure 1. COA A: Model of two track rapid development.

5.1.2. Tasks

Tasks that can accomplished within CDC development:

- Institute a change management program
- Establish workflow QA program
- Establish instructional effectiveness QA program
- Engage outside entities (e.g., AFCFM, providing agency)
- Establish early ISS involvement in the development process (i.e., recruit clients)
- Develop a team workflow development process
- Increase ISS staff and responsibilities
- Re-task the SME/course writer
- Institute SME training and mentoring
- Implement an online work environment
- Develop reuse planning guidelines
- Provide metadata and course development models useful beyond e-CDCs for other organizations

Tasks that constitute an e-CDC development infrastructure:

- Select and implement an initial set of e-CDCs
- Develop a modular technical system infrastructure architecture
- Use existing specifications and system:
 - SCORM
 - CORDRA
 - LOM
- Become contributors within the ADL/IMS/IEEE-LTSC specifications
- Investigate XML (e.g., DocBook) as a primary source code for content
- Develop infrastructure modules:

Authorization &
authentication
Services Broker
Metadata Engine
Metadata Repository
Metadata Registry
Content Structure
Repository (TOC)
Content Repository
Content Authoring Tool

Content Manager
Content Structure
Registry
Object Identifier Service
(Handles System)
Authoring Tool Registry
Document (Content)
Manager
Workflow Manager
Portal

Taxonomy Manager
User Directory Services
Metadata Performance
Support System or
Metadata Tool
Tutorial
Learning Management
System (LMS)
Student Management
System

**Air Force Institute for Advanced Distributed Learning
e-CDC Transition Project : Executive Summary**

Assessment Management System

Extended Capabilities (e.g., services directory, state persistence, learning design tools, sequencing, learner profiles, question and test systems)

5.2. COA B: A bolus of funding

1.1.1. Summary

An infusion of resources will enable a transition to an e-CDC development capability. Continuing resources may not be available immediately, therefore robust systems must be instituted that may be limited in capabilities. Commitment of adequate resources supports the development of a foundational technological infrastructure proceeds independent from the changes required in the present process. Much of the technological development should be performed by contractors, using off-the-shelf (OTS) products when appropriate. Course development changes will be performed by AFIADL, with the advice of consultants as required. Integration of the technological infrastructure with the modified CDC process will produce the transition to e-CDC development.

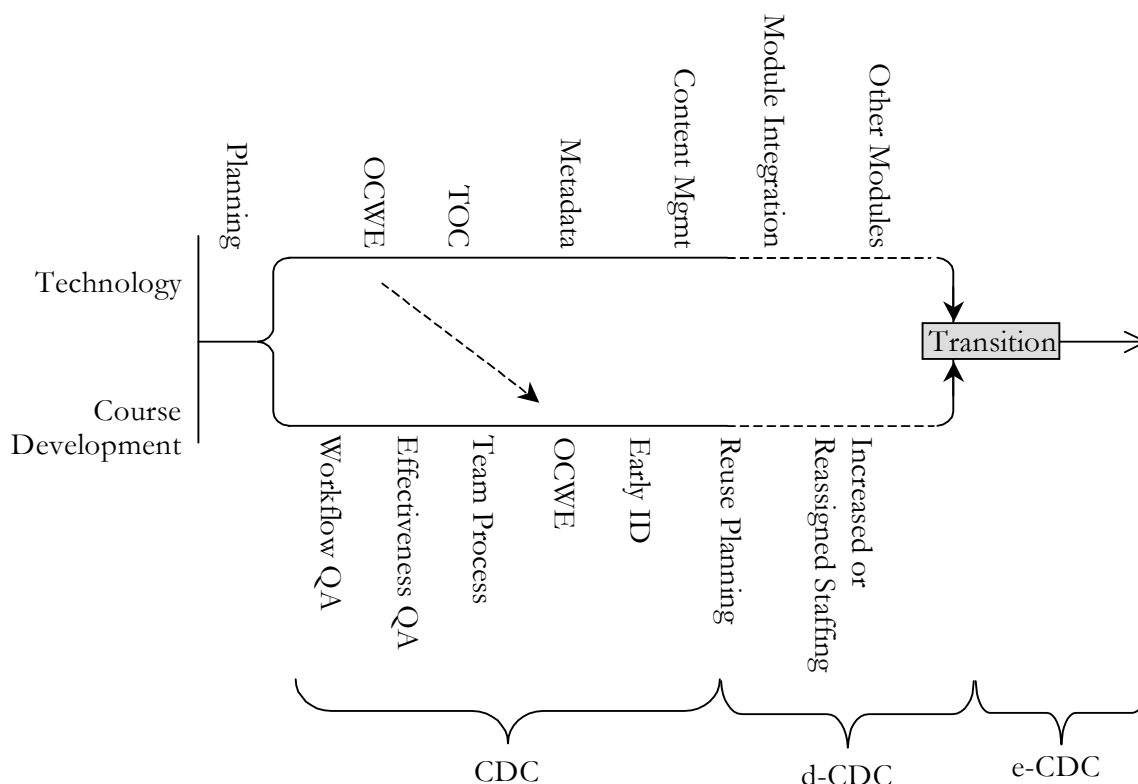


Figure 2. A jump change.

1.1.2. Tasks

Tasks that can accomplished within CDC development:

- Institute a change management program
- Establish workflow QA program
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- Develop a team workflow development process
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- Investigate XML (e.g., DocBook) as a primary source code for content
- Develop infrastructure modules:

Metadata Engine
Metadata Repository
Metadata Registry
Content Structure Repository (TOC)
Content Repository
Content Authoring Tool
Content Manager
Content Structure Registry

Object Identifier Service (Handles System)
Authoring Tool Registry
Document (Content) Manager
Workflow Manager
Portal
Metadata Performance Support System or
Metadata Tool Tutorial

5.3. COA C: Slow, internally funded

1.1.3. Summary

With limited resources, AFIADL transitions to an e-CDC solution through a sequence of developments with limited parallel effort. At each stage, an improved, stable, functional and useful course development process results. A principal cost is time.

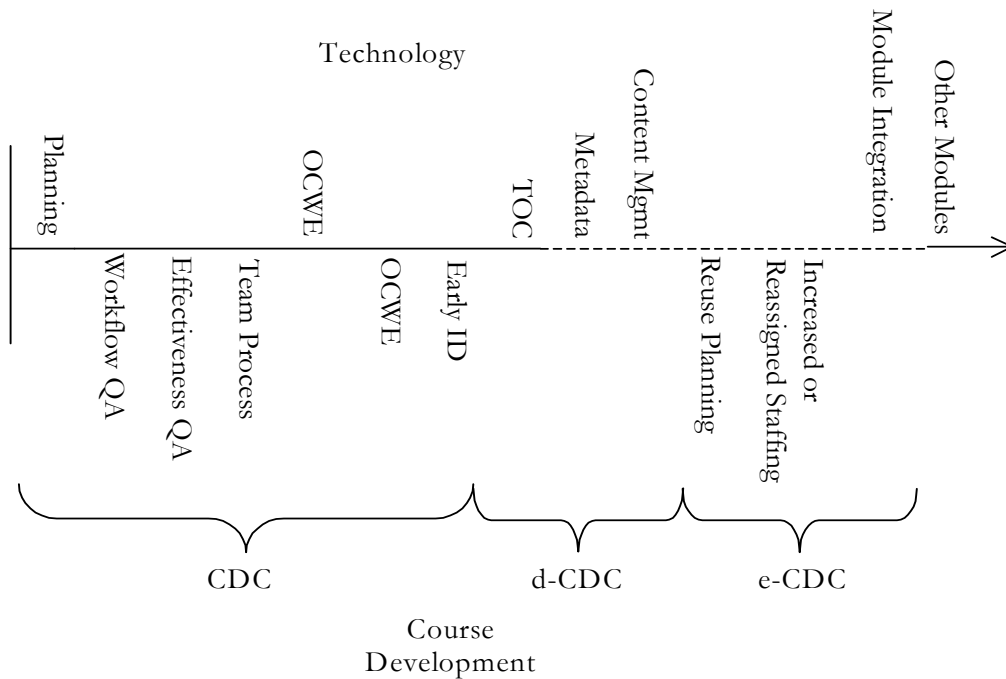


Figure 3. Linear development

1.1.4. Tasks

Tasks that can accomplished within CDC development:

- Institute a change management program
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- Establish instructional effectiveness QA program
- Engage outside entities (e.g., AFCFM, providing agency)
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- Develop a team workflow development process
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Tasks that constitute an e-CDC development infrastructure:

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- Develop infrastructure modules:

Metadata Engine
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Content Structure Registry
Object Identifier Service (Handles System)
Metadata Performance Support System or
Metadata Tool Tutorial